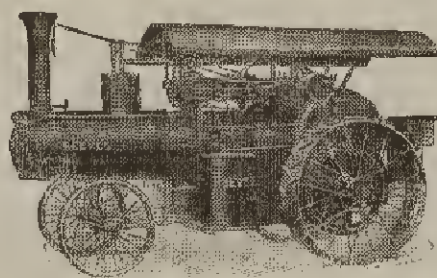


**DIRECTIONS FOR OPERATING**

**REEVES**

**Double Cylinder, Simple  
and Cross Compound  
Engines**



**Emerson-Brantingham Implement Co.,**  
(Incorporated)

Rockford, Illinois

**REEVES WORKS, COLUMBUS, INDIANA**

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EMERSON-BRANTINGHAM IMPLEMENT COMPANY,  
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## Directions for Operating Reeves Double Cylinder, Simple and Cross Compound Engines

The first thing that will be seen when the trimming box is opened is this book, the next thing that should be done is to carefully read it. The marginal index will help to find the subject on which information is desired.

### Trimmings

The small and delicate trimmings, also a kit of tools are in the wooden box, other parts are in the smoke box and in the fire box of the boiler.

### Oil Holes And Holes For Fittings

All the oil holes, also holes in pipes and in the boiler are filled with a wooden plug to keep the cinders and dust out during transportation. If by any means a plug is missing, great care should be taken to clean out the hole before the oil cap or fitting is attached.

### Steam Gauge

In placing the steam guage, the syphon should first be filled with water. The tube in the guage is filled with air which is compressed by the water in the syphon and in time the water will absorb the air. The tube will then be filled with water which cannot get back to the syphon and in freezing weather will ruin the guage. Therefore, once a year before freezing weather comes, the guage should be taken off and the water extracted from it, which can be done by a motion similar to that of starting the ink in a faulty fountain pen.

### Exhaust Nozzle

After the fixtures are all placed, the boiler can be filled so that the water shows in one-half of the glass. Before starting the fire see that the correct bushing is in the exhaust nozzle. The coal bushing is in place when the engine leaves the factory. If wood or straw is used for fuel, the bushing should be changed to the one having on it the correct marking. If very poor coal is used, it is sometimes desirable to use the wood bushing in the exhaust nozzle, and in case of very good wood, the coal bushing may be used. The wood bushing can also be used when the straw is exceptionally good. Between the three bushings, the correct draught can be had to suit any kind of fuel.

### Starting Fire And Cleaning Tubes

When the steam guage shows 10 or 15 pounds pressure, the blower may be turned on to force the draught and after the boiler is hot and steam is almost up to the working pressure, the tubes should be cleaned as considerable soot adheres to them while starting the fire and getting up steam.

### Coal Bushing

When firing with coal break up the lumps so that the largest piece is about the size of a man's fist. Keep the fire not more than 5 inches thick. When firing spread the coal on the thin places and never allow the fire to burn out in spots, as cold air will rush into the fire box and cool off the boiler, which will necessitate the burning of an undue amount of fuel. Some kinds of coal will clinker when stirred from the top, especially if the fire is quite hot. Keep the fire clean by shaking the grates.

### Protect the Tubes

Keep the fire door closed as much as possible, as nothing will cause the tubes to leak as much as holding the fire door open too long when the boiler is hot, thus allowing cold air to rush into the fire box, which will happen especially when the engine is pulling a heavy load. The fire door should be closed after each shovel of coal is distributed over the fire.

### Draught Door

Control the fire by the draught door. Open it wide when getting up steam and partially open it when engine is running. Never check the fire by opening the fire door. Keep the ash pan cleaned out; nothing will ruin the grates like an accumulation of ashes.

### Wood Burning

In firing with wood, keep the fire box well filled, placing the wood so that there will be no hollow places. Open the draught door just enough to admit air to support combustion. A great volume of air rushing through an open fire will bring poor results.

<b>Spark Arrester</b>	A screen spark arrester is provided for wood and straw burning and should be used with the cone shaped screen pointing upward. This will afford a free outlet for the gases. When the screen is pointing downward (the old way) it will retard the draught which will cut down the steaming capacity of the boiler.
<b>Straw Burning Grates for Other Fuel</b>	In the strawburning engine, there is a full set of grate bars furnished, which can be used for burning coal and wood. In this case the adjustable dead plate should be drawn back to allow the full length of the grates for service. Long tongs are provided for handling the grates and the dead plate.
<b>Straw Grates for Straw</b>	In burning straw use a grate bar in every third place, leaving a larger space between each bar, thus allowing the matted straw ashes to be stirred through.
<b>Straw Burning Dead Plate</b>	Adjust the dead plate to suit the condition of the straw and load. The second notch from the tube sheet may be best for average conditions. The advantage in pushing the dead plate forward is that the fire burns from the forward end of the fire box, thus reducing the amount of flying straws and getting the full value of the fire arch. Also when the fire is thin, if the draught door is left wide open, there it not so much air rushing through the fire box.
<b>Straw Ashes</b>	Keep the ashes from under the grates. Pull them on to the outer ash pan where they can be made wet with hose provided for the purpose. Scrape the tube sheet from time to time when straw ashes accumulate over them. A scraper is provided for the purpose which is used at the peep hole of the boiler.
<b>Straw Burning</b>	If the straw is fed too fast, it will hinder combustion and less heat will be made than if fed moderately. Only stir the fire to get the ashes through the grates, which should only be done when necessary to clear the fire for draught. Much stirring will cause flying straws which will lodge across the tubes and much scraping of the tube sheet from the peep hole will be necessary. See that the swinging door in the straw chute works freely. After heavy firing never let cold air rush through the fire box, as the sudden contraction of the ends of the tubes will cause them to leak.
<b>Fire Brick Arch</b>	The straw burning fire arch can be left in the fire box when burning wood or coal. It is especially good in burning bituminous coal, as it burns up the smoke.
<b>Packing the Rods</b>	Before starting the engine see that the stuffing boxes are packed. If the boxes are filled with packing, they will run with less leakage and less friction than if a little packing is used, which will have to be drawn up so tight that it is apt to cut the rod.
<b>Oiling</b>	See that all grease and oil cups are filled and other parts are oiled. Directions for operating the REEVES cylinder oil pump are attached to the pump. There is an oil pipe in the differential gear hub which might be neglected, especially if the gearing is enclosed in a case. An opening in the side of the gear case is provided for this oiling. The differential pinions which are also hid by the casing should be oiled through the same hole in the casing.
<b>Gearing</b>	When the gearing is incased, the teeth are apt to be neglected. A door in the casing is provided for examination of the teeth and should be frequently looked after. The lifetime of a bearing or gearing largely depends on how well it is lubricated. A good way to lubricate the gear teeth is to apply axle grease occasionally and liquid oil continuously by means of the oil cups on top of the gear shields.
<b>Oil</b>	Use only a good grade of cylinder, engine and hard oil. If a cheap grade is used, it will cost more in the end, much more of it will be required to do the work and the results will not be as good. Use plenty of good oil when the engine is new as it will be a paying investment.



**Water  
Shock**

In starting, when the cylinders are cold, go slow to allow the water to escape from the cylinder cocks. If the engine is run at a high speed with water in the cylinders, there is danger of breaking the cylinder or its head. The cylinder head packing may be blown out and it is hard on all the parts of the engine. However, the REEVES engine with its balanced D valve, which can be driven from its seat by the water, will stand more abuse than other types of valves.

**Water  
Level**

The ideal way for maintaining the water level in the boiler is, while the work is going on, to keep the pump or injector going continuously. If the water is forced into the boiler at a rapid rate for a short duration and then shut off for a time, the exhaust heater cannot do efficient work. Both the pump and injector can be throttled by partially closing the steam valve on the pump and the water valve on the injector. Endeavor to keep the glass guage half full of water. Do not rely entirely on the glass guage as the fittings may be stopped up with lime or the valves may be closed. Blow the lower fitting out every day.

**Low Water  
and Fusible  
Plug**

Never let the water get out of sight. When the boiler is level and the water gets down to the lower packing gland, there is two inches of water over the crown sheet. If it gets much lower than this, there is danger of melting out the fusible plug. If this should happen, there is an extra plug sent with the engine in the trimming box and should be carried in the tool box of the engine. When a fusible plug is melted out, it should be refilled with tin so that it will be ready for use should the water again be left get too low. Never substitute a solid plug for the fusible plug.

**Injector  
and Pump**

Here are a few things which will make an injector fail to work. Scale or dirt in either of the three jets of the injector, a leaky suction pipe, a choked screen on the end of the suction pipe and a limed up feed pipe where the water enters the boiler are the most common troubles. To examine the strainer, remove the bushing where the suction pipe enters the tank. The pump sometimes fails to start due to rust, when it has been standing idle for a long time. In this case take off one of the heads and break the piston loose by pushing it to the end of its stroke. Special printed matter on the pump and injector will be found in the trimmings box and should be preserved.

**Governor**

The speed of the engine can be changed about 200 revolutions by changing the position of the weights of the REEVES Governor, which is done from the platform of the engine. If a very special speed is required, one of the pulleys may be made larger by wrapping it. If a higher speed on the engine is required, make the pulley on the governor larger for a lower speed, increase the diameter of the pulley on the crank shaft.

**Economy  
of Steam**

Always keep the throttle wide open for continuous work, allowing the engine to be regulated by the governor and always hook up the valve gear to get a short cut off on the valve, causing a high pressure in the cylinder, which will insure a greater degree of expansion and better economy will follow. To fix the reverse lever for these conditions, especially for a constant load such as running a machine or doing draw bar work, hook up the reverse lever toward the center notch till the speed begins to diminish, then move the lever out one notch, this will bring up the speed and give the engine sufficient power to carry the load. If more power is required for a short while, such as going up a steep grade or plowing through a tough piece of ground, or if the steam pressure is low, the reverse lever can be hooked down a notch and when conditions adjust themselves, it can be hooked up again. When the maximum power of the engine is required, the reverse lever is placed in the end notch but when economy is expected, the load should be reduced so that the lever can be hooked up and the closer to the center notch it is placed, the more economical on fuel and water the engine will be.

### **Starting a Load**

When the reverse lever is in the end notch of the section, the steam is cut off at three-fourths of the stroke. There is a blank space between this notch and the end stop and when the lever is at the end stop, the valve admits steam nearly the entire length of the stroke. The engine should not be run this way for continuous work but this provision is simply for convenience in starting a heavy load and tightening the drive belt when the steam pressure is low. There is no dead point in the REEVES engine when reverse lever is in the end notch nor is there when the reverse lever is hooked up one notch.

### **Intercepting Valve**

The intercepting valve is used for converting the cross compound engine into a simple double cylinder engine and is useful in starting the engine, stretching the drive belt, and when extra power is needed on the road or at the plow, especially when the steam pressure is low. This valve is simply an emergency device to help the engine out of hard places and should not be used for continuous work. The intercepting valve not only gives extra power for starting but with its use, the dead points disappear so that it starts a compound engine like our double simple engine. When the lever controlling this valve is in the upward position the engine is compound and when it is down, it is simple.

### **Connecting Rod Adjustment**

The crank box of the connecting rod has a wedge for adjustment controlled by a screw in the top and one in the bottom. The thick part of the wedge is at the bottom. The crosshead box of the rod is adjusted by a wedge which is driven with a hammer. Undo the setscrew and drive the wedge with a hammer and draw up the setscrew again after driving. Always see that the boxes are loose enough to prevent heating. Usually a box should be loose enough so that it can be moved by hand lengthwise on its own bearing.

### **Crosshead Adjustment**

The crosshead shoes are wedge-shaped and are held by bolts running through their sides. To adjust them, slacken up the bolts and drive the shoes. Care should be taken to adjust the shoe which will put the piston rod in line with the guides. A pair of calipers or a compass will aid in doing this. The adjustment of the crosshead shoes can be checked by watching the rod while it is running where it enters the stuffing box. If the rod moves up and down, the crosshead is not the right height with reference to the piston. When the shoes are adjusted correctly, the rod will run true. See that the crosshead fits loosely in the guides by shaking it.

### **Boxes with Liners**

The main crank shaft bearing and the valve gear boxes are adjusted by liners. Always keep enough liners between the cap and the box so that the cap may be drawn up solid. Never depend on lock nuts to adjust the cap, as it is more apt to wear out and heat. The valve gear connections and the eccentric yoke should be loose enough to shake them a little by hand, and to note if the crank shaft box needs adjusting, the shaft will move backward and forward if it is too loose. This can be very easily determined by sight.

### **Care of Balanced Valve**

The valve is balanced with a ring against the steam chest cover. There is nothing about it to get out of order if it is properly oiled. If the engine is put away for a long time, it will be well to remove the steam chest cover to oil the ring where it fits on the valve, also oil the valve seat and the seat against the cover. It is also well in this case to oil the inside of the cylinder. A heavy oil, such as cylinder oil, is very good for this purpose. If the engine is not thus oiled when put away and if the valve ring is stuck with rust it can be taken off and cleaned up with oil. See that the springs are active in holding out the ring to the steam chest cover. Another good way to get the valve in shape to have a long rest is just before the engine is shut down for the last time, force a pint of oil through the engine by screwing the pump plunger up by hand as quickly as possible. This also protects the cylinder from rust.

## **Gaskets**

On a new engine the nuts on the steam chest cover, cylinder heads, intercepting valve and on the steam pipe flanges should be drawn occasionally in the first week the engine is used. Never draw the nuts up unduly tight but simply take up the shrinkage of the gasket. If the nuts are kept tight while the gasket is being vulcanized, it will never blow out. If it is desirable to fix a gasket so that the head, cover or flange can be easily removed, dress one side of the gasket with graphite. The side thus dressed will not adhere to the metal and the other side which is not dressed will stick and help to hold it in place.

## **Drain in Freezing Weather**

In freezing weather, at night and when engine is not used, be sure that all the drain cocks are open so that water cannot collect in pipes and castings. Every place that should be drained is provided with a plug. The tanks can be drained by taking out a large plug from the pipe which connects the tanks. To drain the main steam pipe and cylinders: While the engine is running, with the throttle wide open and all the cocks open about the cylinders, steam chest, heater, receiver and intercepting valve, shut off the steam by the valve on top of the dome. The steam pump and injector should be treated in the same manner. When the engine is put away for the winter, in addition to the foregoing, the plug in the bottom of the boiler should be taken out to drain the water that will not run out at the blow off pipe.

## **Blowoff**

There is no advantage in blowing off the boiler when the pressure is high, yet blowing out the water with 10 or 15 pounds pressure will do no harm. The little mud in the bottom of the boiler that can be blown out is just what is lying near the blow-off and can easily be washed out when cleaning the boiler.

## **Washing Boiler**

Clean out the boiler as often as the water demands. In ordinary conditions, once a week is sufficient, but in case of muddy water or clear water which contains a great deal of foreign matter or solids, the boiler should be cleaned more than once a week. There are places in which the water is clear but so full of impurities that to keep the space between the tubes and the side of the fire box from filling up, the boiler has to be washed out every day the engine is used. There are hand holes in every place where cleaning is necessary. Also in the top of the boiler where water can be forced through the tubes and over the crown sheet. There is a scraper provided for removing the scales and mud and is specially adapted to the cleaning out the sides of the fire box.

## **Boiler Scale**

If the water forms scale in the boiler, something should be used to loosen and prevent more from forming. It is impossible to recommend a boiler compound not knowing the nature of the water which will be used. Soda ash is good to loosen and prevent the most common scale which is carbonate of lime and sulphate of lime. In average conditions 5 lbs. of soda ash to 200 gallons of water will give good results. This proportion may answer until the results can be noted. If the inside of the boiler presents a clean, bright surface, too much soda ash is used. If the scale does not loosen or still accumulates, more soda ash is required to do the work. The inside surface of the boiler should be examined each time it is cleaned, as the water is changed from time to time and the water taken from the same stream changes at different seasons of the year due to the rainfall. The ideal condition is to have on the surface a very thin coating of lime.

## **Boiler Compound**

The Dearborn Chemical Co., Chicago, Ill., will analyze water and prescribe a boiler compound, if a gallon of water is sent to them. In this way a compound suited to the water and the right quantity can be used. The U. S. Graphite Co., Saginaw, Michigan, will sell a boiler graphite that is recommended to loosen and prevent all kinds of scale and not injure the boiler. The precaution in the foregoing paragraph should be heeded in using any kind of ingredients for the prevention of scale.



## Cleaning Stack and Exhaust Nozzle

When cleaning out the boiler, the stack and exhaust nozzles should occasionally be examined. The moisture which comes from the exhaust steam causes the soot to adhere to the inside of the stack and also to the exhaust nozzle bushings. The reduction in the openings will hinder the draught in the case of the stack and reduce the power of the engine in the case of the exhaust nozzles.

## Water Bottom Boilers

The boiler is of the water bottom type. There being no circulation in the part below the grates which affords an additional receptacle for all kinds of sediment. Thus the sides of the fire box are not so apt to be ruined by an accumulation of sediment which is likely to collect between times of cleaning, especially if the water is very bad. This type of boiler affords an air tight ash pan which is useful in holding fire all night.

## Foaming

The boiler being of the water bottom type will not foam except under the most unfavorable conditions, namely, running too long with very bad water. There is nothing that can be put into the water to prevent foaming. The only thing to do is a more frequent change of water. Hooking up the valve gear of the engine to the limit will also help to prevent foaming, in that it will reduce the consumption of the steam.

## Eccentric Setting

The eccentric is keyed to the shaft and needs no attention but should it be necessary to reset the eccentric, it can be done by the following: Set the engine on dead center, then the eccentric should be nearly opposite the crank pin or at a place that will bring the pin in the lower part of the eccentric yoke, central with the tumble or reversing shaft. To test it more accurately, the valve or valve rod will not move when the reverse lever is pulled backward and forward, while the engine is on dead center. If the valve rod does thus move, the tumble shaft is either too high or too low, more likely too high on an old engine, which can be fixed by placing a liner between the engine frame and the rear saddle. This will raise the crank shaft and compensate for the amount the crank shaft bearing has been worn down and will be equivalent to lowering the tumble shaft box. If perfect results cannot be had by placing liners under the crank shaft bearing, this will show that the eccentric should be slightly moved. The direction it should be moved will suggest itself.

## Valve Setting

After the eccentric is found to be correctly set, all there is then to do with the valve is to see that it has the same amount of lead at each end, which will be about one-sixteenth of an inch. This valve gear will then be given an equal cut off. The lead should be looked after every few years, as the wearing of the crank shaft box, the eccentric yoke and valve gear connections will change the lead so that it will have more on the one end and less on the other end of the valve.

## Reach Rod

The reach rod which connects the reverse lever with the tumble shaft and which controls the proportion of cut off on the forward and backward motion may for some reason need to be adjusted. Set the reverse lever in the end notch for the forward motion and note the maximum port opening which the engine is turned, then place reverse lever in the other end notch and if the port opening is not the same, on this motion, the case will suggest if the reach rod should be shortened or lengthened. The ends of the rod are screwed on and can be easily changed.

## Adjustments

Keep every thing up, never allow a box to pound. If a nut or bolt is loose, draw it up before it ruins something else. Keep the guide chain reasonably tight.

If you find the valves slap when the engine is running without a load and the reverse lever is in the end notch, don't imagine there is something wrong with the valve but hook the engine up a notch or two and it will quit. The reason for this is the very long cut off will reduce the pressure in the cylinder so that the compression or cushion is greater than the steam pressure in the chest and therefore is not able to hold the valve up to its seat.



If the engine runs while the reverse lever is in the center notch, don't imagine there is something wrong with the setting of the valve. If there was, it would not thus run. The reason for this is that the boxes of the engine run very freely and the lead of the valve fills the clearance with steam, the expansion of which drives the empty engine.

## Test

Every engine before it leaves the factory is thoroughly tested in every respect, both under the belt and on the road. A maximum brake test of four times the normal horse power is applied and an economy test is made on every engine, using an average load. By this means we know for a certainty that every engine which goes from our Works is perfect as far as it is possible to make it, and if there is something about the engine that don't seem right, remember that it was right when it left our Works and likely is something out of adjustment which a competent engineer will find if he carefully reads the directions herein given.

# Directions for Setting Valves

—ON—

## Reeves Simple and Compound Engines

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To set the valve, turn the engine on dead center. The crank pin is on dead center when the valve rod will not move while the reverse lever is moved. The eccentric is keyed to the shaft, therefore all there is to do in setting the valve is to divide the lead between each end of the valve. The lead is about one sixteenth of an inch. The valve is set by shifting the valve on the valve stem which is secured by clamp blocks. The valve should be loose between the blocks but have no end play.

To examine the reach rod, place the reverse lever in the end notch and by turning the engine see how much the port is opened on each end of the valve, then reverse the motion by placing the lever in the other end notch and if the port opening is more or less it can be controlled by changing the length of the reach rod.

In case of placing a new crank shaft in the engine, the eccentric can be set as follows: Place the engine on dead center by means of a tram, and the eccentric nearly opposite the crank pin, at a point that will bring the lower pin of the eccentric yoke central with the reversing shaft. This should be tested on both centers by moving the reverse lever to see that there is no movement in the valve rod while this is done. If this cannot be accomplished by placing the eccentric, the crank shaft may have to be raised due to wear in the crank shaft box. An easy way to raise the box is to place a liner between the engine frame and the saddle. After the eccentric is correctly set it should be keyed to the shaft.

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## Emerson-Brantingham Company

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